WHAT IS CLAIMED IS:

1. A method of determining the spacing between a patterned template and a substrate, comprising

positioning the patterned template and the substrate in a spaced relationship to one another such that a gap is created between the patterned template and the substrate,

applying light to the patterned template and the substrate, wherein the light comprises a plurality of wavelengths;

monitoring light reflected from a surface of the patterned template and the substrate;

determining the distance between the surface of the patterned template and the substrate based on the monitored light.

2. The method of claim 1, further comprising determining an error signal, wherein the error signal corresponds to the difference between a desired distance between the surface of the patterned template and the substrate and the determined distance between the surface of the patterned template and the substrate.

3. The method of claim 1, further comprising determining an error signal, wherein the error signal corresponds to the difference between a desired distance between the surface of the patterned template and the substrate and the determined distance between the surface of the patterned template and the substrate; and sending the error signal to at least one actuator, wherein the at least one actuator is configured to adjust the distance between the surface of the patterned template and the substrate.

4. The method of claim 1, wherein patterned template comprises a plurality of recesses on a surface of the patterned template.

5. The method of claim 1, wherein patterned template comprises a plurality of recesses on a surface of the patterned template, wherein the recesses are of a known depth.

6. The method of claim 1, wherein patterned template comprises a plurality of recesses on a surface of the patterned template and wherein applying light to the patterned template and substrate comprises passing light through one or more of the recesses.

7. The method of claim 1, wherein patterned template comprises a plurality of recess on a surface of the patterned template and wherein the depth of each recess is at least ¼ of the mean wavelength of the light applied to the patterned template and substrate.

8. The method of claim 1, further comprising determining the distance between the surface of the patterned template and the substrate at a plurality of locations and determining whether the surface of the patterned template and substrate are substantially parallel based on the plurality of distance determinations.

9. The method of claim 8, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the patterned template and the substrate required to bring the surface of the patterned template and the substrate into a substantially parallel configuration.

10. The method of claim 8, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the patterned template and the substrate required to bring the surface of the patterned template and the substrate into a substantially parallel configuration; and sending the error signal to at least one actuator, wherein the at least one actuator is configured to adjust the relative position of the surface of the patterned template and the substrate to achieve a substantially parallel configuration.

11. The method of claim 1, further comprising determining the distance between the surface of the patterned template and the substrate at 3 or more non-colinear locations and determining

whether the surface of the patterned template and substrate are substantially parallel based on the 3 or more distance determinations.

12. The method of claim 11, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the patterned template and the substrate required to bring the surface of the patterned template and the substrate into a substantially parallel configuration.

13. The method of claim 11, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the patterned template and the substrate required to bring the surface of the patterned template and the substrate into a substantially parallel configuration; and sending the error signal to at least one actuator, wherein the at least one actuator is configured to adjust the relative position of the surface of the patterned template and the substrate to achieve a substantially parallel configuration.

14. The method of claim 1, wherein the substrate comprises at least one layer on a surface of the substrate.

15. The method of claim 1, wherein the substrate comprises at least one layer on a surface of the substrate; the method further comprising determining a thickness of the at least one layer on the surface of the substrate.

16. The method of claim 1, wherein the substrate comprises a plurality of layers on a surface of the substrate; the method further comprising determining a thickness of the each of the layers.

17. The method of claim 1, wherein determining the distance between the surface of the patterned template and the substrate comprises:

obtaining data representative of the intensity of at least some of the wavelengths of light reflected;

calculating a wavenumber, wherein the wavenumber is a function of the refractive index of a material disposed between the template and the substrate and the wavelength of the refractive light;

calculating the distance between the patterned template and the substrate, wherein the distance between the patterned template and the substrate is a function of the wavenumber and the intensity of reflected light corresponding to the wavenumber.

18. The method of claim 1, wherein monitoring light reflected from the surface of the patterned template and the substrate comprises monitoring variations in intensity of the light across various wavelengths.

19. A method of determining the spacing between a substantially planar template and a patterned substrate, comprising

positioning the substantially planar template and the patterned substrate in a spaced relationship to one another such that a gap is created between the substantially planar template and the substrate,

applying light to the substantially planar template and the patterned substrate, wherein the light comprises a plurality of wavelengths;

monitoring light reflected from a surface of the substantially planar template and the patterned substrate;

determining the distance between the substantially planar template and the patterned substrate based on the monitored light.

20. The method of claim 19, further comprising determining an error signal, wherein the error signal corresponds to the difference between a desired distance between the surface of the

substantially planar template and the patterned substrate and the determined distance between the surface of the substantially planar template and the patterned substrate.

21. The method of claim 19, further comprising determining an error signal, wherein the error signal corresponds to the difference between a desired distance between the surface of the substantially planar template and the patterned substrate and the determined distance between the surface of the substantially planar template and the patterned substrate; and sending the error signal to at least one actuator, wherein the at least one actuator is configured to adjust the distance between the surface of the substantially planar template and the patterned substrate

22. The method of claim 19, wherein substantially planar template comprises a plurality of recesses on a surface of the substantially planar template.

23. The method of claim 19, wherein substantially planar template comprises a plurality of recesses on a surface of the substantially planar template, wherein the recesses are of a known depth.

24. The method of claim 19, wherein substantially planar template comprises a plurality of recesses on a surface of the substantially planar template and wherein applying light to the substantially planar template and patterned substrate comprises passing light through one or more of the recesses.

25. The method of claim 19, wherein substantially planar template comprises a plurality of recess on a surface of the substantially planar template and wherein the depth of each recess is at least ¼ of the mean wavelength of the light applied to the substantially planar template and patterned substrate.

26. The method of claim 19, further comprising determining the distance between the surface of the substantially planar template and the patterned substrate at a plurality of locations and

determining whether the surface of the substantially planar template and patterned substrate are substantially parallel based on the plurality of distance determinations.

27. The method of claim 26, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the substantially planar template and the patterned substrate required to bring the surface of the substantially planar template and the patterned substrate into a substantially parallel configuration.

28. The method of claim 26, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the substantially planar template and the patterned substrate required to bring the surface of the substantially planar template and the patterned substrate into a substantially parallel configuration; and sending the error signal to at least one actuator, wherein the at least one actuator is configured to adjust the relative position of the surface of the substantially planar template and the patterned substrate to achieve a substantially parallel configuration.

29. The method of claim 19, further comprising determining the distance between the surface of the substantially planar template and the patterned substrate at 3 or more non-colinear locations and determining whether the surface of the substantially planar template and patterned substrate are substantially parallel based on the 3 or more distance determinations.

30. The method of claim 29, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the substantially planar template and the patterned substrate required to bring the surface of the substantially planar template and the patterned substrate into a substantially parallel configuration.

31. The method of claim 29, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the substantially planar template and the patterned substrate required to bring the surface of the substantially planar template and the patterned substrate into a substantially parallel configuration; and sending the error signal to at least one actuator, wherein the at least one actuator is configured to

adjust the relative position of the surface of the substantially planar template and the patterned substrate to achieve a substantially parallel configuration.

32. The method of claim 19, wherein the patterned substrate comprises at least one layer on a surface of the patterned substrate.

33. The method of claim 19, wherein the patterned substrate comprises at least one layer on a surface of the patterned substrate; the method further comprising determining a thickness of the at least one layer on the surface of the patterned substrate.

34. The method of claim 19, wherein the patterned substrate comprises a plurality of layers on a surface of the patterned substrate; the method further comprising determining a thickness of the each of the layers.

35. The method of claim 19, wherein determining the distance between the surface of the substantially planar template and the substrate comprises:

obtaining data representative of the intensity of at least some of the wavelengths of light reflected;

calculating a wavenumber, wherein the wavenumber is a function of the refractive index of a material disposed between the template and the substrate and the wavelength of the refractive light;

calculating the distance between the patterned template and the substrate, wherein the distance between the patterned template and the substrate is a function of the wavenumber and the intensity of reflected light corresponding to the wavenumber.

36. The method of claim 19, wherein monitoring light reflected from the surface of the substantially planar template and the patterned substrate comprises monitoring variations in intensity of the light across various wavelengths.

37. A method of forming a pattern on a substrate using a patterned template that is transparent to an activating light, the method comprising:

applying an activating light curable liquid to a portion of the substrate;

positioning the patterned template and the substrate in a spaced relationship to one another such that a gap is created between the patterned template and the substrate;

determining the distance between the patterned template and the substrate using a light based measuring device;

applying activating light through the template to the liquid, wherein the application of activating light substantially cures the liquid, and wherein a pattern of the patterned template is formed in the cured liquid; and

separating the patterned template from the cured liquid.

38. The method of claim 37, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser.

39. The method of claim 37, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser, and further comprising moving the substrate with respect to the fluid dispenser while the liquid is being dispensed to create a predetermined pattern.

40. The method of claim 37, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser, and further comprising moving the substrate with respect to the fluid dispenser while the liquid is being dispensed to create a predetermined pattern, and wherein the predetermined pattern is a pattern that is

configured to inhibit the formation of air bubbles in the liquid when the patterned template contacts the liquid as the patterned template and substrate are positioned in a spaced relation.

41. The method of claim 37, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser, and further comprising moving the substrate with respect to the fluid dispenser while the liquid is being dispensed to create a predetermined pattern, and wherein the predetermined pattern is selected such that the liquid fills the gap in an area substantially equal to the surface area of the patterned template.

42. The method of claim 37, wherein positioning the patterned template and the substrate in a spaced relationship comprises:

positioning the patterned template over the substrate; and

moving the patterned template toward the substrate until a desired spaced relationship is achieved, wherein the liquid on the substrate substantially fills the gap as the patterned template is moved toward the substrate.

43. The method of claim 37, wherein positioning the patterned template and the substrate in a spaced relationship comprises positioning the patterned template at a distance of less than about 200 nm from the substrate.

44. The method of claim 37, wherein positioning the patterned template and the substrate in a spaced relationship comprises positioning the patterned template in a substantially parallel orientation to the substrate.

45. The method of claim 37, wherein separating the patterned template from the cured liquid comprises:

moving the template to a substantially non-parallel orientation; and

moving the patterned template away from the substrate.

46. The method of claim 37, wherein the patterned template comprises at least some features that are less than 250 nm in size.

47. The method of claim 37, wherein the cured liquid comprises at least some features less than about 250 nm in size after the patterned template is separated from the cured liquid.

48. The method of claim 37, wherein positioning the patterned template and the substrate in a spaced relationship comprises:

positioning the patterned template over the substrate, wherein the patterned template is substantially non-parallel to the substrate;

moving the patterned template toward the substrate, wherein the patterned template remains in a substantially non-parallel orientation with respect to the substrate as the template is moved toward the substrate, and

orienting the patterned template in a substantially parallel orientation to the substrate, wherein the patterned template is in a desired spaced relationship to the substrate.

49. The method of claim 37, wherein determining the distance between the patterned template and the substrate using a light based measuring device comprises:

applying light to the template and the substrate, wherein the light comprises a plurality of wavelengths;

monitoring light reflected from a surface of the template and the substrate; and

determining the distance between the template and the substrate based on the monitored light.

50. The method of claim 49, further comprising determining an error signal, wherein the error signal corresponds to the difference between a desired distance between the surface of the patterned template and the substrate and the determined distance between the surface of the patterned template and the substrate; and sending the error signal to at least one actuator,

wherein the at least one actuator is configured to position the template and the substrate in a spaced relationship to one another.

51. The method of claim 49, wherein determining the distance between the template and the substrate comprises:

obtaining data representative of the intensity of at least some of the wavelengths of light reflected;

calculating a wavenumber, wherein the wavenumber is a function of the refractive index of a material disposed between the template and the substrate and the wavelength of the refractive light;

calculating the distance between the patterned template and the substrate, wherein the distance between the patterned template and the substrate is a function of the wavenumber and the intensity of reflected light corresponding to the wavenumber.

52. The method of claim 37, wherein the substrate comprises silicon, gallium, germanium, or indium.

53. The method of claim 37, wherein the substrate comprises a dielectric material.

54. The method of claim 37, wherein the substrate comprises quartz, sapphire, silicon dioxide, or polysilicon.

55. The method of claim 37, wherein the patterned template comprises quartz.

56. The method of claim 37, wherein the patterned template comprises indium tin oxide.

57. The method of claim 37, wherein the activating light curable liquid comprises an ultraviolet light curable composition.

58. The method of claim 37, wherein the activating light curable liquid composition comprises a photoresist material.

59. The method of claim 37, further comprising:

forming a transfer layer on the substrate prior to applying the liquid to the substrate; and etching the transfer layer after separating the patterned template from the substrate, wherein etching the transfer layer imparts the pattern to the transfer layer.

60. The method of claim 37, wherein the substrate comprises at least one layer on a surface of the substrate.

61. The method of claim 37, wherein the substrate comprises at least one layer on a surface of the substrate; the method further comprising determining a thickness of the at least one layer on the surface of the substrate.

62. The method of claim 37, further comprising determining the distance between the surface of the patterned template and the substrate at 3 or more non-colinear locations and determining whether the surface of the patterned template and substrate are substantially parallel based on the 3 or more distance determinations.

63. The method of claim 62, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the patterned template and the substrate required to bring the surface of the patterned template and the substrate into a substantially parallel configuration.

64. The method of claim 62, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the patterned template and the substrate required to bring the surface of the patterned template and the substrate into a substantially parallel configuration; and sending the error signal to at least one actuator,

wherein the at least one actuator is configured to adjust the relative position of the surface of the patterned template and the substrate to achieve a substantially parallel configuration.

65. A semiconductor device made by the method of claim 37.

66. A method of planarizing a substrate using a substantially planar template that is transparent to an activating light, the method comprising:

applying an activating light curable liquid to a portion of the substrate;

positioning the template and the substrate in a spaced relationship to one another such that a gap is created between the template and the substrate;

determining the distance between the template and the substrate using a light based measuring device;

applying activating light through the template to the liquid, wherein the application of activating light substantially cures the liquid, and wherein the cured liquid is substantially planar; and

separating the template from the cured liquid.

67. The method of claim 66, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser.

68. The method of claim 66, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser, and further comprising moving the substrate with respect to the fluid dispenser while the liquid is being dispensed to create a predetermined pattern.

69. The method of claim 66, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser, and further comprising moving the substrate with respect to the fluid dispenser while the liquid is being dispensed to create a predetermined pattern, and wherein the predetermined pattern is a pattern that is configured to inhibit the formation of air bubbles in the liquid when the template contacts the liquid as the template and substrate are positioned in a spaced relation.

70. The method of claim 66, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser, and further comprising moving the substrate with respect to the fluid dispenser while the liquid is being dispensed to create a predetermined pattern, and wherein the predetermined pattern is selected such that the liquid fills the gap in an area substantially equal to the surface area of the portion of the substrate.

71. The method of claim 66, wherein positioning the template and the substrate in a spaced relationship comprises:

positioning the template over the substrate; and

moving the template toward the substrate until a desired spaced relationship is achieved, wherein the liquid on the substrate substantially fills the gap as the template is moved toward the substrate.

72. The method of claim 66, wherein positioning the template and the substrate in a spaced relationship comprises positioning the template at a distance of less than about 200 nm from the substrate.

73. The method of claim 66, wherein positioning the template and the substrate in a spaced relationship comprises positioning the template in a substantially parallel orientation to the substrate.

74. The method of claim 66, wherein separating the template from the cured liquid comprises:

moving the template to a substantially non-parallel orientation; and

moving the template away from the substrate.

75. The method of claim 66, wherein positioning the template and the substrate in a spaced relationship comprises:

positioning the template over the substrate, wherein the template is substantially non-parallel to the substrate;

moving the template toward the substrate, wherein the template remains in a substantially non-parallel orientation with respect to the substrate as the template is moved toward the substrate, and

orienting the template in a substantially parallel orientation to the substrate, wherein the template is in a desired spaced relationship to the substrate.

76. The method of claim 66, wherein determining the distance between the template and the substrate using a light based measuring device comprises:
applying light to the template and the substrate, wherein the light comprises a plurality of wavelengths;

monitoring light reflected from a surface of the template and the substrate; and

determining the distance between the template and the substrate based on the monitored light.

77. The method of claim 76, further comprising determining an error signal, wherein the error signal corresponds to the difference between a desired distance between the surface of the patterned template and the substrate and the determined distance between the surface of the patterned template and the substrate; and sending the error signal to at least one actuator, wherein the at least one actuator is configured to position the template and the substrate in a spaced relationship to one another.

78. The method of claim 76, wherein determining the distance between the template and the substrate comprises:

obtaining data representative of the intensity of at least some of the wavelengths of light reflected;

calculating a wavenumber, wherein the wavenumber is a function of the refractive index of a material disposed between the template and the substrate and the wavelength of the refractive light;

calculating the distance between the patterned template and the substrate, wherein the distance between the patterned template and the substrate is a function of the wavenumber and the intensity of reflected light corresponding to the wavenumber.

79. The method of claim 66, wherein the substrate comprises silicon, gallium, germanium, or indium.

80. The method of claim 66, wherein the substrate comprises a dielectric material.

81. The method of claim 66, wherein the substrate comprises quartz, sapphire, silicon dioxide, or polysilicon.

82. The method of claim 66, wherein the template comprises quartz.

83. The method of claim 66, wherein the template comprises indium tin oxide.

84. The method of claim 66, wherein the activating light curable liquid comprises an ultraviolet light curable composition.

85. The method of claim 66, wherein the activating light curable liquid composition comprises a photoresist material.

86. The method of claim 66, further comprising:

forming a transfer layer on the substrate prior to applying the liquid to the substrate; and etching the transfer layer after separating the template from the substrate, wherein etching the transfer layer imparts the pattern to the transfer layer.

87. The method of claim 66, wherein the substrate comprises at least one layer on a surface of the substrate.

88. The method of claim 66, wherein the substrate comprises at least one layer on a surface of the substrate; the method further comprising determining a thickness of the at least one layer on the surface of the substrate.

89. The method of claim 66, further comprising determining the distance between the surface of the template and the substrate at 3 or more non-colinear locations and determining whether the surface of the template and substrate are substantially parallel based on the 3 or more distance determinations.

90. The method of claim 89, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the template and the substrate required to bring the surface of ~~the~~ template and the substrate into a substantially parallel configuration.

91. The method of claim 89, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the template and the substrate required to bring the surface of the template and the substrate into a substantially parallel configuration; and sending the error signal to at least one actuator, wherein the at least one actuator is configured to adjust the relative position of the surface of the template and the substrate to achieve a substantially parallel configuration.

92. A semiconductor device made by the method of claim 66.

93. A method of forming a pattern on a substrate using a patterned template that is transparent to an activating light, the method comprising:

applying an activating light curable liquid to a portion of the substrate;

positioning the patterned template and the substrate in a spaced relationship to one another such that a gap is created between the patterned template and the substrate;

monitoring the distance between the patterned template and the surface using a light based measuring device;

adjusting the position of the template with respect to the substrate while monitoring the distance between the template and the substrate such that the template and the substrate are at a predetermined distance from each other;

applying activating light through the template to the liquid, wherein the application of activating light substantially cures the liquid, and wherein a pattern of the patterned template is formed in the cured liquid; and

separating the patterned template from the cured liquid.

94. The method of claim 93, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser.

95. The method of claim 93, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser, and further comprising moving the substrate with respect to the fluid dispenser while the liquid is being dispensed to create a predetermined pattern.

96. The method of claim 93, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser, and further comprising moving the substrate with respect to the fluid dispenser while the liquid is being dispensed to create a predetermined pattern, and wherein the predetermined pattern is a pattern that is configured to inhibit the formation of air bubbles in the liquid when the patterned template contacts the liquid as the patterned template and substrate are positioned in a spaced relation.

97. The method of claim 93, wherein applying the activating light curable liquid to a portion of the substrate comprises dispensing the liquid with a fluid dispenser, and further comprising moving the substrate with respect to the fluid dispenser while the liquid is being dispensed to create a predetermined pattern, and wherein the predetermined pattern is selected such that the liquid fills the gap in an area substantially equal to the surface area of the patterned template.

98. The method of claim 93, wherein the predetermined distance is less than about 200 nm.

99. The method of claim 93, wherein positioning the patterned template and the substrate in a spaced relationship comprises positioning the patterned template in a substantially parallel orientation to the substrate.

100. The method of claim 93, wherein separating the patterned template from the cured liquid comprises:

moving the template to a substantially non-parallel orientation; and

moving the patterned template away from the substrate.

101. The method of claim 93, wherein the patterned template comprises at least some features that are less than 250 nm in size.

102. The method of claim 93, wherein the cured liquid comprises at least some features less than about 250 nm in size after the patterned template is separated from the cured liquid.

103. The method of claim 93, wherein adjusting the position of the template with respect to the substrate comprises:

moving the patterned template toward the substrate, wherein the patterned template remains in a substantially non-parallel orientation with respect to the substrate as the template is moved toward the substrate, and

orienting the patterned template in a substantially parallel orientation to the substrate, when the template and the substrate are at the predetermined distance from each other.

104. The method of claim 93, wherein monitoring the distance between the patterned template and the substrate using a light based measuring device comprises:

applying light to the template and the substrate, wherein the light comprises a plurality of wavelengths;

monitoring light reflected from a surface of the template and the substrate; and

determining the distance between the template and the substrate based on the monitored light.

105. The method of claim 104, further comprising determining an error signal, wherein the error signal corresponds to the difference between a desired distance between the surface of the patterned template and the substrate and the determined distance between the surface of the patterned template and the substrate; and sending the error signal to at least one actuator, wherein the at least one actuator is configured to adjust the position of the template with respect to the substrate.

106. The method of claim 104, wherein monitoring the distance between the template and the substrate comprises:

obtaining data representative of the intensity of at least some of the wavelengths of light reflected;

calculating a wavenumber, wherein the wavenumber is a function of the refractive index of a material disposed between the template and the substrate and the wavelength of the refractive light;

calculating the distance between the patterned template and the substrate, wherein the distance between the patterned template and the substrate is a function of the wavenumber and the intensity of reflected light corresponding to the wavenumber.

107. The method of claim 93, wherein the substrate comprises silicon, gallium, germanium, or indium.

108. The method of claim 93, wherein the substrate comprises a dielectric material.

109. The method of claim 93, wherein the substrate comprises quartz, sapphire, silicon dioxide, or polysilicon.

110. The method of claim 93, wherein the patterned template comprises quartz.

111. The method of claim 93, wherein the patterned template comprises indium tin oxide.

112. The method of claim 93, wherein the activating light curable liquid comprises an ultraviolet light curable composition.

113. The method of claim 93, wherein the activating light curable liquid composition comprises a photoresist material.

114. The method of claim 93, further comprising:

forming a transfer layer on the substrate prior to applying the activating light curable liquid to the substrate; and

etching the transfer layer after separating the patterned template from the substrate, wherein etching the transfer layer imparts the pattern to the transfer layer.

115. The method of claim 93, wherein the substrate comprises at least one layer on a surface of the substrate.

116. The method of claim 93, wherein the substrate comprises at least one layer on a surface of the substrate; the method further comprising determining a thickness of the at least one layer on the surface of the substrate.

117. The method of claim 93, further comprising monitoring the distance between the surface of the patterned template and the substrate at 3 or more non-colinear locations and determining whether the surface of the patterned template and substrate are substantially parallel based on the 3 or more distance monitored.

118. The method of claim 117, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the patterned template and the substrate required to bring the surface of the patterned template and the substrate into a substantially parallel configuration.

119. The method of claim 117, further comprising determining an error signal, wherein the error signal corresponds to a relative movement between the surface of the patterned template and the substrate required to bring the surface of the patterned template and the substrate into a substantially parallel configuration; and sending the error signal to at least one actuator, wherein the at least one actuator is configured to adjust the relative position of the surface of the patterned template and the substrate to achieve a substantially parallel configuration.

120. A semiconductor device made by the method of claim 93.

121. A system for forming a pattern on a substrate using a patterned template comprising:

a top frame;

an orientation stage coupled to the top frame, the orientation stage comprising a template support, and a patterned template disposed in the support;

a substrate stage configured to support the substrate, wherein the stage is positioned below the orientation stage; and

a light based measurement device coupled to the orientation stage, wherein the light based measurement device is configured to determine a distance between the patterned template and the substrate.

122. The system of claim 121, wherein the orientation stage further comprises:

a first flexure member, wherein the first flexure member is configured to pivot about a first orientation axis during use;

a second flexure member coupled to the first flexure member, wherein the second flexure member is configured to pivot about a second orientation axis during use; and

the template support coupled to the second flexure member, wherein the template support is configured to hold the patterned template during use;

wherein the second flexure member is coupled to the first flexure member such that the patterned template, when disposed in the support, moves about a pivot point intersected by the first and second orientation axis during use.

123. The system of claim 121, wherein the light based measurement device comprises a broad-band spectrometer.

124. The system of claim 121, wherein the measurement device comprises a laser interferometer.

125. The system of claim 121, wherein the light based measurement device comprises at least one optical probe configured to direct light through the template.

126. The system of claim 121, wherein the light based measurement device comprises at least one optical probe configured to direct light through the template, and wherein the optical probe is configured to be movable from a first position, above the template, to a second position, away from the template.

127. The system of claim 121, wherein the measurement device comprises at least one optical probe configured to direct light through the template, and wherein the at least one optical probe is substantially transparent to a selected wavelength of light.

128. The system of claim 121, wherein the measurement device comprises at least one optical probe configured to detect light reflected from the substrate.

129. The system of claim 121, wherein the measurement device comprises at least one optical probe configured to detect light reflected from the substrate, and wherein the optical probe is configured to be movable from a first position, above the template, to a second position away from the template.

130. The system of claim 121, wherein the measurement device comprises at least one optical probe configured to detect light reflected from the substrate, and wherein the at least one optical probe is substantially transparent to a selected wavelength of light.

131. The system of claim 121, further comprising an activating light source, wherein the activating light source is configured to direct activating light toward the substrate during use.

132. The system of claim 121, wherein the measurement device comprises an electronic imaging device.

133. The system of claim 121, wherein the substrate comprises at least one layer of a known refractive index on a surface of the substrate.

134. The system of claim 121, wherein the substrate comprises at least one layer of a known refractive index on a surface of the substrate, and wherein the light based measuring device is further configured to determine a thickness of the at least one layer on the surface of the substrate.

135. The system of claim 121, wherein the patterned template comprises an alignment mark, and wherein the alignment mark is complimentary to an alignment mark on a substrate during use.

136. The system of claim 122, wherein the first orientation axis is substantially orthogonal to the second orientation axis.

137. The system of claim 122, wherein the first flexure member comprises first and second arms, wherein the first arm comprises a first set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second arm comprises a second set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis.

138. The system of claim 122, wherein the second flexure member comprises third and fourth arms, wherein the third arm comprises a third set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis, and wherein the fourth arm comprises a fourth set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis.

139. The system of claim 122, wherein the first flexure member comprises first and second arms, wherein the first arm comprises a first set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second arm comprises a second set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second flexure member comprises third and fourth arms, wherein the third arm comprises a third set of flexure joints which are configured to provide pivotal motion of the

second flexure member about the second orientation axis, and wherein the fourth arm comprises a fourth set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis.

140. The system of claim 122, further comprising actuators coupled to the first and second flexure members, wherein the actuators are configured to cause pivoting of the first and second flexure members about the first and second orientation axis, respectively, during use.

141. The system of claim 122, further comprising actuators coupled to the first and second flexure members, wherein the actuators are configured to cause pivoting of the first and second flexure members about the first and second orientation axis, respectively, during use, wherein the actuators are piezoelectric actuators.

142. The system of claim 122, wherein the first flexure member comprises a first opening, the second flexure member comprises a second opening, and the support comprises a third opening, wherein each of the first, second and third openings are configured to allow activating light to be directed onto the template during use, wherein the first, second and third openings are substantially aligned when the first flexure member is coupled to the second flexure member.

143. The system of claim 121, further comprising a precalibration stage coupled to the orientation stage and the top frame, wherein the precalibration stage is configured to move the orientation stage toward and away from the substrate during use.

144. The system of claim 121, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage is configured to move the orientation stage toward and away from the substrate during use, wherein the pre-calibration comprises at least one actuator coupled to the orientation stage, wherein the actuator is configured to move the orientation stage toward and away from the substrate.

145. The system of claim 121, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage comprises first and second support members and at least one actuator coupled to the top frame and the second support member, the actuator extending through the first support member, wherein the first support member is coupled to the top frame, the second support member is coupled to the first support member and the orientation stage, and wherein the actuator is configured to move the orientation stage toward and away from the substrate during use, and wherein the actuators are coupled to the top frame and the second support member.

146. The system of claim 121, wherein the substrate stage comprises a vacuum chuck, the vacuum chuck comprising a chuck body and a vacuum flow system coupled to the chuck body, wherein the vacuum flow system is configured to apply a suction force at the surface of the chuck body during use.

147. The system of claim 121, wherein the substrate stage is configured to move the substrate along a plane substantially parallel to the patterned template.

148. The system of claim 121, further comprising a fluid dispenser coupled to the top frame.

149. The system of claim 121, further comprising a plurality of fluid dispensers coupled to the top frame.

150. The system of claim 121, wherein the patterned template comprises quartz.

151. The system of claim 121, wherein at least a portion of the patterned template comprises SiOx where x is less than 2.

152. The system of claim 121, wherein at least a portion of the patterned template comprises SiOx where x is about 1.5.

153. The system of claim 121, wherein the patterned template comprises indium tin oxide.

154. A system for forming a pattern on a substrate using a patterned template comprising:

a top frame;

an orientation stage coupled to the top frame, the orientation stage comprising a template support, and a patterned template disposed in the support, wherein the patterned template comprises a gap sensing section;

a substrate stage configured to support the substrate, wherein the stage is positioned below the orientation stage; and

a light based measurement device coupled to the orientation stage, wherein the light based measurement device is configured to determine a distance between the gap sensing portion of the patterned template and the substrate.

155. The system of claim 154, wherein the orientation stage further comprises:

a first flexure member, wherein the first flexure member is configured to pivot about a first orientation axis during use;

a second flexure member coupled to the first flexure member, wherein the second flexure member is configured to pivot about a second orientation axis during use; and

the template support coupled to the second flexure member, wherein the template support is configured to hold the patterned template during use;

wherein the second flexure member is coupled to the first flexure member such that the patterned template, when disposed in the support, moves about a pivot point intersected by the first and second orientation axis during use.

156. The system of claim 154, wherein the light based measurement device comprises a broad-band spectrophotometer.

157. The system of claim 154, wherein the measurement device comprises a laser interferometer.

158. The system of claim 154, wherein the light based measurement device comprises at least one optical probe configured to direct light through the gap sensing section of the template.

159. The system of claim 154, wherein the light based measurement device comprises at least one optical probe configured to direct light through the gap sensing section of the template, and wherein the optical probe is configured to be movable from a first position, above the template, to a second position, away from the template.

160. The system of claim 154, wherein the measurement device comprises at least one optical probe configured to direct light through the gap sensing section of the template, and wherein the at least one optical probe is substantially transparent to a selected wavelength of light.

161. The system of claim 154, wherein the gap sensing section of the template comprises one or more recesses on a surface of the template.

162. The system of claim 154, wherein the gap sensing section of the template comprises one or more recesses on a surface of the template, and wherein each recess is of a known depth.

163. The system of claim 154, wherein the gap sensing section of the template comprises one or more recesses on a surface of the template, and wherein each recess has a depth of at least ¼ the mean wavelength of light used by the light based measuring device.

164. The system of claim 154, wherein the measurement device comprises at least one optical probe configured to detect light reflected from the substrate.

165. The system of claim 154, wherein the measurement device comprises at least one optical probe configured to detect light reflected from the substrate, and wherein the optical probe is

configured to be movable from a first position, above the template, to a second position away from the template.

166. The system of claim 154, wherein the measurement device comprises at least one optical probe configured to detect light reflected from the substrate, and wherein the at least one optical probe is substantially transparent to a selected wavelength of light.

167. The system of claim 154, further comprising an activating light source, wherein the activating light source is configured to direct activating light toward the substrate during use.

168. The system of claim 154, wherein the measurement device comprises an electronic imaging device.

169. The system of claim 154, wherein the substrate comprises at least one layer of a known refractive index on a surface of the substrate.

170. The system of claim 154, wherein the substrate comprises at least one layer of a known refractive index on a surface of the substrate, and wherein the light based measuring device is further configured to determine a thickness of the at least one layer on the surface of the substrate.

171. The system of claim 154, wherein the patterned template further comprises an alignment mark, and wherein the alignment mark is complimentary to an alignment mark on a substrate during use.

172. The system of claim 155, wherein the first orientation axis is substantially orthogonal to the second orientation axis.

173. The system of claim 155, wherein the first flexure member comprises first and second arms, wherein the first arm comprises a first set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and

wherein the second arm comprises a second set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis.

174. The system of claim 155, wherein the second flexure member comprises third and fourth arms, wherein the third arm comprises a third set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis, and wherein the fourth arm comprises a fourth set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis.

175. The system of claim 155, wherein the first flexure member comprises first and second arms, wherein the first arm comprises a first set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second arm comprises a second set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second flexure member comprises third and fourth arms, wherein the third arm comprises a third set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis, and wherein the fourth arm comprises a fourth set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis.

176. The system of claim 155, further comprising actuators coupled to the first and second flexure members, wherein the actuators are configured to cause pivoting of the first and second flexure members about the first and second orientation axis, respectively, during use.

177. The system of claim 155, further comprising actuators coupled to the first and second flexure members, wherein the actuators are configured to cause pivoting of the first and second flexure members about the first and second orientation axis, respectively, during use, wherein the actuators are piezoelectric actuators.

178. The system of claim 155, wherein the first flexure member comprises a first opening, the second flexure member comprises a second opening, and the support comprises a third

opening, wherein each of the first, second and third openings are configured to allow activating light to be directed onto the template during use, wherein the first, second and third openings are substantially aligned when the first flexure member is coupled to the second flexure member.

179. The system of claim 154, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage is configured to move the orientation stage toward and away from the substrate during use.

180. The system of claim 154, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage is configured to move the orientation stage toward and away from the substrate during use, wherein the pre-calibration comprises at least one actuator coupled to the orientation stage, wherein the actuator is configured to move the orientation stage toward and away from the substrate.

181. The system of claim 154, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage comprises first and second support members and at least one actuator coupled to the top frame and the second support member, the actuator extending through the first support member, wherein the first support member is coupled to the top frame, the second support member is coupled to the first support member and the orientation stage, and wherein the actuator is configured to move the orientation stage toward and away from the substrate during use, and wherein the actuators are coupled to the top frame and the second support member.

182. The system of claim 154, wherein the substrate stage comprises a vacuum chuck, the vacuum chuck comprising a chuck body and a vacuum flow system coupled to the chuck body, wherein the vacuum flow system is configured to apply a suction force at the surface of the chuck body during use.

183. The system of claim 154, wherein the substrate stage is configured to move the substrate along a plane substantially parallel to the patterned template.

184. The system of claim 154, further comprising a fluid dispenser coupled to the top frame.

185. The system of claim 154, further comprising a plurality of fluid dispensers coupled to the top frame.

186. The system of claim 154, wherein the patterned template comprises quartz.

187. The system of claim 154, wherein at least a portion of the patterned template comprises SiOx where x is less than 2.

188. The system of claim 154, wherein at least a portion of the patterned template comprises SiOx where x is about 1.5.

189. The system of claim 154, wherein the patterned template comprises indium tin oxide.

190. A system for forming a pattern on a substrate using a patterned template comprising:

a top frame;

an orientation stage coupled to the top frame, the orientation stage comprising a template support and a patterned template disposed in the support;

a substrate stage configured to support the substrate, wherein the stage is positioned below the orientation stage;

an activating light source optically coupled to the patterned template, wherein the activating light source is configured to direct activating light through the patterned template onto the substrate; and

a light based measurement device coupled to the orientation stage, wherein the light based measurement device is configured to determine a distance between the patterned template and the substrate, wherein the light based measurement device comprises:

an illumination system configured to direct detecting light through the template during use, wherein the illumination system is positioned between the template and the activating light source, and wherein the illumination system is substantially transparent to the activating light produced by the activating light source; and

a detection system optically coupled to the illumination system and configured to detect light reflected from the substrate positioned on the substrate stage.

191. The system of claim 190, wherein the orientation stage further comprises:
a first flexure member, wherein the first flexure member is configured to pivot about a first orientation axis during use;
a second flexure member coupled to the first flexure member, wherein the second flexure member is configured to pivot about a second orientation axis during use; and
the template support coupled to the second flexure member, wherein the template support is configured to hold the patterned template during use;
wherein the second flexure member is coupled to the first flexure member such that the patterned template, when disposed in the support, moves about a pivot point intersected by the first and second orientation axis during use.

192. The system of claim 190, wherein the light based measurement device comprises a broad-band spectrophotometer.

193. The system of claim 190, wherein the measurement device comprises a laser interferometer.

194. The system of claim 190, wherein the illumination system comprises at least one optical probe configured to direct light through the template during use.

195. The system of claim 190, wherein the detection system comprises at least one optical probe configured to detect light reflected from the substrate.

196. The system of claim 190, wherein the light based measurement device further comprises an electronic imaging device.

197. The system of claim 190, wherein the substrate comprises at least one layer of a known refractive index on a surface of the substrate.

198. The system of claim 190, wherein the substrate comprises at least one layer of a known refractive index on a surface of the substrate, and wherein the light based measuring device is further configured to determine a thickness of the at least one layer on the surface of the substrate.

199. The system of claim 190, wherein the patterned template further comprises an alignment mark, and wherein the alignment mark is complimentary to an alignment mark on a substrate during use.

200. The system of claim 191, wherein the first orientation axis is substantially orthogonal to the second orientation axis.

201. The system of claim 191, wherein the first flexure member comprises first and second arms, wherein the first arm comprises a first set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second arm comprises a second set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis.

202. The system of claim 191, wherein the second flexure member comprises third and fourth arms, wherein the third arm comprises a third set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis, and wherein the fourth arm comprises a fourth set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis.

203. The system of claim 191, wherein the first flexure member comprises first and second arms, wherein the first arm comprises a first set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second arm comprises a second set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second flexure member comprises third and fourth arms, wherein the third arm comprises a third set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis, and wherein the fourth arm comprises a fourth set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis.

204. The system of claim 191, further comprising actuators coupled to the first and second flexure members, wherein the actuators are configured to cause pivoting of the first and second flexure members about the first and second orientation axis, respectively, during use.

205. The system of claim 191, further comprising actuators coupled to the first and second flexure members, wherein the actuators are configured to cause pivoting of the first and second flexure members about the first and second orientation axis, respectively, during use, wherein the actuators are piezoelectric actuators.

206. The system of claim 191, wherein the first flexure member comprises a first opening, the second flexure member comprises a second opening, and the support comprises a third opening, wherein each of the first, second and third openings are configured to allow activating light to be directed onto the template during use, wherein the first, second and

third openings are substantially aligned when the first flexure member is coupled to the second flexure member.

207. The system of claim 190, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage is configured to move the orientation stage toward and away from the substrate during use.

208. The system of claim 190, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage is configured to move the orientation stage toward and away from the substrate during use, wherein the pre-calibration comprises at least one actuator coupled to the orientation stage, wherein the actuator is configured to move the orientation stage toward and away from the substrate.

209. The system of claim 190, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage comprises first and second support members and at least one actuator coupled to the top frame and the second support member, the actuator extending through the first support member, wherein the first support member is coupled to the top frame, the second support member is coupled to the first support member and the orientation stage, and wherein the actuator is configured to move the orientation stage toward and away from the substrate during use, and wherein the actuators are coupled to the top frame and the second support member.

210. The system of claim 190, wherein the substrate stage comprises a vacuum chuck, the vacuum chuck comprising a chuck body and a vacuum flow system coupled to the chuck body, wherein the vacuum flow system is configured to apply a suction force at the surface of the chuck body during use.

211. The system of claim 190, wherein the substrate stage is configured to move the substrate along a plane substantially parallel to the patterned template.

212. The system of claim 190, further comprising a fluid dispenser coupled to the top frame.

213. The system of claim 190, further comprising a plurality of fluid dispensers coupled to the top frame.

214. The system of claim 190, wherein the patterned template comprises quartz.

215. The system of claim 190, wherein at least a portion of the patterned template comprises SiOx where x is less than 2.

216. The system of claim 190, wherein at least a portion of the patterned template comprises SiOx where x is about 1.5.

217. The system of claim 190, wherein the patterned template comprises indium tin oxide.

218. A system for forming a pattern on a substrate using a patterned template comprising:

a top frame;

an orientation stage coupled to the top frame, the orientation stage comprising a template support and a patterned template disposed in the support;

a substrate stage configured to support the substrate, wherein the stage is positioned below the orientation stage;

an activating light source optically coupled to the patterned template, wherein the activating light source is configured to direct activating light through the patterned template onto the substrate; and

a light based measurement device coupled to the orientation stage, wherein the light based measurement device is configured to determine a distance between the patterned template and the substrate, wherein the light based measurement device comprises:

an illumination system configured to direct detecting light though the template during use, wherein the illumination system is positioned between the template and the activating light source during use, and wherein the illumination system is movable such that the illumination system is positionable into a position that is not in optical interference with the activating light source and the patterned template; and

a detection system optically coupled to the illumination system and configured to detect light reflected from the substrate positioned on the substrate stage.

219. The system of claim 218, wherein the orientation stage further comprises:
a first flexure member, wherein the first flexure member is configured to pivot about a first orientation axis during use;
a second flexure member coupled to the first flexure member, wherein the second flexure member is configured to pivot about a second orientation axis during use; and
the template support coupled to the second flexure member, wherein the template support is configured to hold the patterned template during use;
wherein the second flexure member is coupled to the first flexure member such that the patterned template, when disposed in the support, moves about a pivot point intersected by the first and second orientation axis during use.

220. The system of claim 218, wherein the light based measurement device comprises a broad-band spectrophotometer.

221. The system of claim 218, wherein the measurement device comprises a laser interferometer.

222. The system of claim 218, wherein the illumination system comprises at least one optical probe configured to direct light through the template during use.

223. The system of claim 218, wherein the detection system comprises at least one optical probe configured to detect light reflected from the substrate.

224. The system of claim 218, wherein the light based measurement device further comprises an electronic imaging device.

225. The system of claim 218, wherein the substrate comprises at least one layer of a known refractive index on a surface of the substrate.

226. The system of claim 218, wherein the substrate comprises at least one layer of a known refractive index on a surface of the substrate, and wherein the light based measuring device is further configured to determine a thickness of the at least one layer on the surface of the substrate.

227. The system of claim 218, wherein the patterned template further comprises an alignment mark, and wherein the alignment mark is complimentary to an alignment mark on a substrate during use.

228. The system of claim 219, wherein the first orientation axis is substantially orthogonal to the second orientation axis.

229. The system of claim 219, wherein the first flexure member comprises first and second arms, wherein the first arm comprises a first set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second arm comprises a second set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis.

230. The system of claim 219, wherein the second flexure member comprises third and fourth arms, wherein the third arm comprises a third set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis, and wherein the fourth arm comprises a fourth set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis.

231. The system of claim 219, wherein the first flexure member comprises first and second arms, wherein the first arm comprises a first set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second arm comprises a second set of flexure joints which are configured to provide pivotal motion of the first flexure member about the first orientation axis, and wherein the second flexure member comprises third and fourth arms, wherein the third arm comprises a third set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis, and wherein the fourth arm comprises a fourth set of flexure joints which are configured to provide pivotal motion of the second flexure member about the second orientation axis.

232. The system of claim 219, further comprising actuators coupled to the first and second flexure members, wherein the actuators are configured to cause pivoting of the first and second flexure members about the first and second orientation axis, respectively, during use.

233. The system of claim 219, further comprising actuators coupled to the first and second flexure members, wherein the actuators are configured to cause pivoting of the first and second flexure members about the first and second orientation axis, respectively, during use, wherein the actuators are piezoelectric actuators.

234. The system of claim 219, wherein the first flexure member comprises a first opening, the second flexure member comprises a second opening, and the support comprises a third opening, wherein each of the first, second and third openings are configured to allow activating light to be directed onto the template during use, wherein the first, second and

third openings are substantially aligned when the first flexure member is coupled to the second flexure member.

235. The system of claim 218, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage is configured to move the orientation stage toward and away from the substrate during use.

236. The system of claim 218, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage is configured to move the orientation stage toward and away from the substrate during use, wherein the pre-calibration comprises at least one actuator coupled to the orientation stage, wherein the actuator is configured to move the orientation stage toward and away from the substrate.

237. The system of claim 218, further comprising a pre-calibration stage coupled to the orientation stage and the top frame, wherein the pre-calibration stage comprises first and second support members and at least one actuator coupled to the top frame and the second support member, the actuator extending through the first support member, wherein the first support member is coupled to the top frame, the second support member is coupled to the first support member and the orientation stage, and wherein the actuator is configured to move the orientation stage toward and away from the substrate during use, and wherein the actuators are coupled to the top frame and the second support member.

238. The system of claim 218, wherein the substrate stage comprises a vacuum chuck, the vacuum chuck comprising a chuck body and a vacuum flow system coupled to the chuck body, wherein the vacuum flow system is configured to apply a suction force at the surface of the chuck body during use.

239. The system of claim 218, wherein the substrate stage is configured to move the substrate along a plane substantially parallel to the patterned template.

240. The system of claim 218, further comprising a fluid dispenser coupled to the top frame.

241. The system of claim 218, further comprising a plurality of fluid dispensers coupled to the top frame.

242. The system of claim 218, wherein the patterned template comprises quartz.

243. The system of claim 218, wherein at least a portion of the patterned template comprises SiOx where x is less than 2.

244. The system of claim 218, wherein at least a portion of the patterned template comprises SiOx where x is about 1.5.

245. The system of claim 218, wherein the patterned template comprises indium tin oxide.